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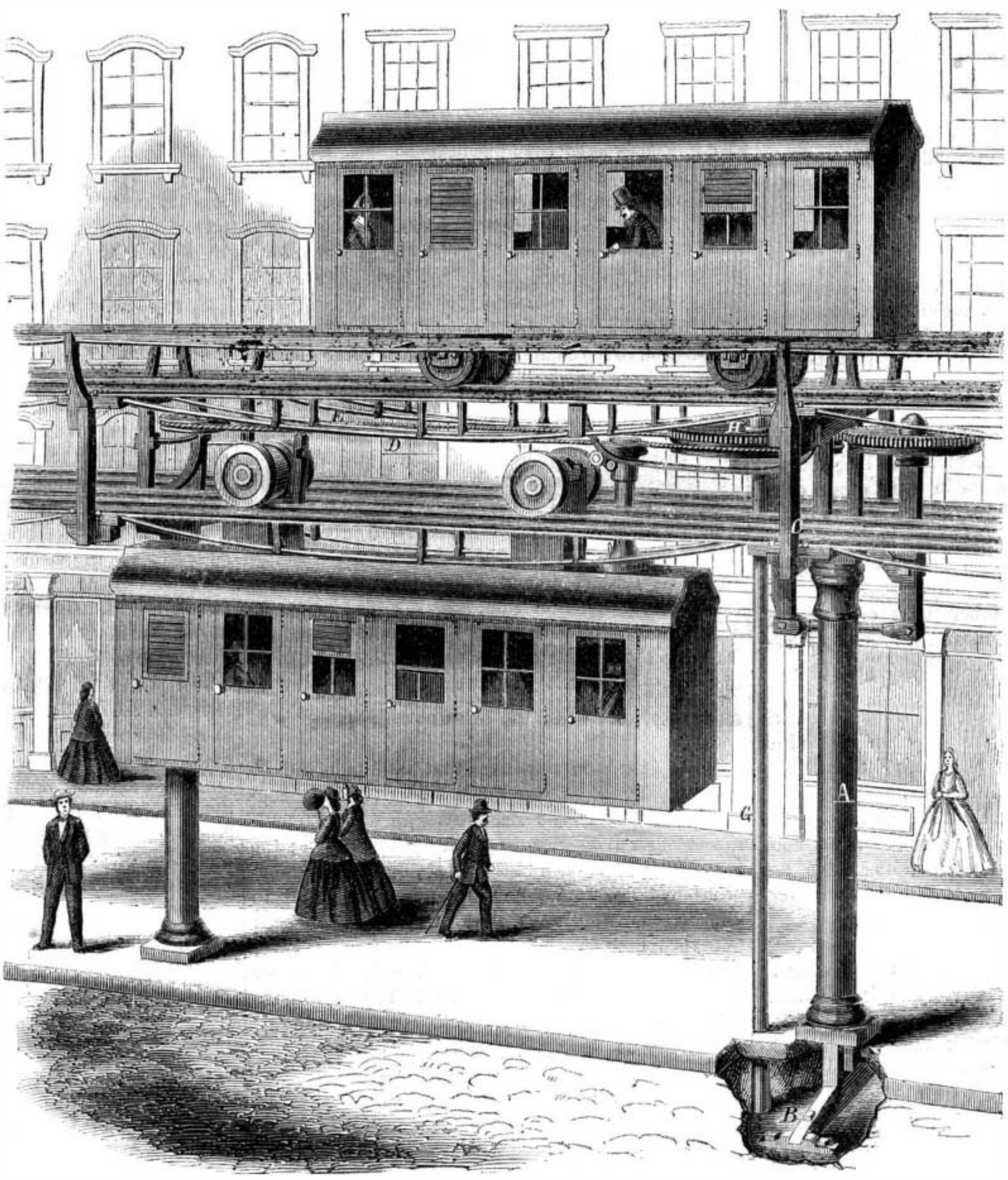
Elevated Railway for Broadway.

The inventor ot this railway, Mr P. Andrew, of Cincinnati, Ohio, has kept three things constantly in view, which he claims, as follows:—First, a light superstructure; second, one that would occupy the least spac ; third, a capacity for carrying passengers adequate to the requirements of Broadway.

A single row of pillars, A, support four tracks—the two upper tracks form a distinct roadway, the two lower ones another—each having an up and a down track. The pillars are placed on the outer edge of the sidewalk, in range with the line of curbstones, having sills cast upon them that extend the length of the arms that sustain the tracks, and in the same direction; these are bolted upon heavy blocks of stone, B, that are placed beneath the sidewalk extending under the street. As will be seen in the engraving, the pendent parts, C, of the arms have projections for the outer rails of the lower tracks, the inside rails are supported from projections from the pillars; upon these projections are placed the chairs upon which the rails rest and are fastened. The chairs for the upper rails are placed upon the upper edge of the arms. The rails are supported by truss rods, D, the ends of the rods being screwed or fastened into the chains.

For the purpose of reducing the car to the smallest space, it is made the width of a seat for two persons, the seat being placed across the car, and doors on the sides of the car for each seat, thus affording easy facility for egress and ingress. The lower cars are suspended from the lower tracks, the wheels being attached to the top of the car; the upper cars run upon the rails as upon other railways. All the cars are propelled by a succession of endless ropes, E, which are sustained at intervals by grooved wheels, F, that are fastened to the lower edge of the arm. The ropes will run the distance of two squares, or a greater distance, if found practicable.



ANDREW'S ELEVATED RAILROAD.

The engines for propelling the ropes are placed under the sidewalk or in the cellars, putting in motion a vertical shaft, G, to which the rope-propelling machinery is attached; this machinery is simple, being two spur wheels, H, above two grooved ones that grasp the rope, so arranged by levers that the grooved wheels tighten upon the rope in proportion to the weight drawn. Each engine will propel two ropes; if the ropes extend 800 feet, the engines will be placed four squares apart.

The machinery for attaching the car to the rope is also simple, and so arranged as to prevent any shock at the starting of the car; the rope is permitted to slip until the car has attained the momentum of the rope. When started the car will proceed to the end of the railway without stopping or requiring the attention of any one, acting automatically—releasing its hold upon one rope, seizing the next in succession unless it is stopped at the stations, being entirely under the control of the person who attends to the stopping and starting of the cars. It is proposed, instead of sending conductors with the cars, to have two persons at each station—one to stop and start the cars, the other to receive tickets; if it is found necessary a conductor may be sent with each car, who can stop or start it at pleasure by pulling or releasing a cord pendent from the top of the car.

Such is the construction of the railway that the cars cannot be run off the tracks; they are removed from one track to the other, at the ends of the road, by a sliding table, and in the same way may be removed at intermediate points, from track to track, or taken from the tracks, when necessary, and placed in depots.

The streets are crossed by suspending the frames that support the tracks in the manner of a suspension bridge. Should it be deemed preferable the whole railway can be built in this way, and present a light and beautiful appearance; but should it be built supported by pillars, except at the crossing of the streets—as sh own in the engraving—it would be, if properly and tastefully constructed, ornamental instead of unsightly, occupying but little space and in no way obstructing the light or darkening the lower stories of the houses.

Those who are desirous of relieving Broadway, and are seeking some means of doing so, should not fail to see the model now in a room of the New York Association for the Advancement of Science and Art, in the Cooper Institute, in care of Dr. L. D. Gale, general secretary of the Association.

Wire Rigging.

We see it stated in one of our cotemporaries—arguing the advantage of wire rigging for ships, and showing the extent to which it is used in Europe—that we have no similar employment for the same article in this country, and that it is not manufactured here. This is a mistake. Wire has not replaced rope so largely in the rigging of our merchant and naval marine as in Europe, because hemp has been cheaper here than it is there, and because economy has not been so much studied by us as by foreign nations. It is, however, coming into greater use, and ships may be found along our wharves and piers almost daily which are supplied with wire rather than rope rigging. As every day sees the increase of the change, it is reasonable to presume that soon we shall be as well supplied as Europe is in this respect.

There is at least one establishment in this State devoted to the manufacture of wire rigging, and one has long been in operation in New Jersey. Both are partially deprived of business now by reason of the war, or rather have been, for business of all kinds is growing, and in the aggregate that of shipbuilding, and consequently the employment of rigging. It is manufactured of all sizes, from sash cords to wire two inches in diameter, and, of course, has an unequaled strength and durability. Beside its chief application, to the rigging of ships, it is employed in warehouses, mines and quarries, for guys to derricks and cranes, and for various other purposes.

We are gratified to see that the manufacture, which for many reasons is growing and important, has been domesticated with us, and hope there may be that success attending it which has been reached in England, and, to a less extent, by other countries. The effect will shortly be perceptible upon our commerce;

if that degree of wisdom attends mercantile builders which is to be expected, and which has been proved by abundant trials elsewhere; while the fabrication will add a growing value to that peculiar business which must always remain at home most in Pennsylvania. The people of New England contemplate establishing a wire-rigging factory in Maine. If the right steps are taken seasonably here there will be no occasion for their doing so, since the material is at hand here which must be transported there, and our knowledge of the business exceeds theirs by a large amount.—*Phila. Gazette.*

NOTES ON NEW DISCOVERIES AND NEW APPLICATIONS OF SCIENCE.

TUNGSTEN OR WOLFRAM.

There seems some probability that metallic tungsten may shortly be introduced into commerce and the arts. This metal was first isolated in 1783, by two Spanish metallurgists, the brothers D'Elhujart. Two years previously Scheele had discovered in the Swedish mineral "tungsten" (so named on account of its density, "tung" meaning heavy and "sten" stone) a new acid, which Bergmann had immediately suspected to belong to a new metallic element. The brothers D'Elhujart found this same acid in the mineral "wolfram," and at length succeeded in separating the metal from it. Bergmann had suggested that the metal which he felt certain would be found in this acid should be called "tungsten," after the mineral in which the acid was first discovered; but the brothers D'Elhujart named it "wolfram," from the mineral from which they actually obtained it. It was subsequently proposed to use for the new metal, instead of either of these names, that of Scheele, the distinguished chemist who had first detected the existence of tungstic acid, but "Berzelius set this suggestion aside, with the just remark that his countryman's immortality required no such artificial prop," and the names tungsten and wolfram are now both used, the metal being usually spoken of by the former name in England and France, and by the latter name in most other countries. The mineral which is called wolfram is a double tungstate of iron and manganese, and usually contains about seventy-five per cent of tungstic acid. It is found in Cornwall, Devonshire, and Cumberland; in Bohemia, Saxony, and other parts of Germany, and also in France, Sweden, and South America—England, Sweden, and Bohemia, being, however, the only countries, so far as is known at present, in which it occurs in any considerable quantity. Tungstic acid is reduced somewhat readily when heated in a current of hydrogen, but by this method the metal is obtained only as a dense dark-gray powder, exceedingly difficult of fusion. The brothers D'Elhujart did not succeed in fusing this powder, and there are upon record only two instances in which its fusion has been effected at all, and in those instances only very small quantities were fused. M. Riche fused a few grammes some years ago by means of a current from a battery of two hundred Bunsen cells belonging to the Faculty of Science of Paris, and in the International Exhibition of 1862 was a very small button of tungsten which Mr. Frederick Versmann had obtained by subjecting about an ounce of the powder for three hours to the most intense heat he could obtain by means of a powerful gas furnace. He used for the purpose a crucible of freshly burnt lime, having found that no graphite or Hessian crucible would stand the requisite heat. We now learn that a Swedish metallurgist has dicovered a method of reducing tungsten by which he obtained it at once in a state of fusion, and that ingots of the pure metal weighing several pounds each are now on exhibition at Stockholm. We are informed, too, that the cost of obtaining tungsten by the new method does not exceed a few shillings per pound. If really obtainable thus cheaply, a metal which will bear exposure to so intense a heat without undergoing either fusion or oxidation must prove of incalculable value to certain of the arts, provided that the difficulties in the way of working it are not insuperable. With the exception of gold and platinum, tungsten is the heaviest metal yet known. Its specific gravity is about 18, that of gold being 19·36, and that of platinum 21·53.

MATCHES WITHOUT PHOSPHORUS.

We had occasion, some months ago, to draw attention to the terrible effect upon the health of the workmen engaged in the manufacture of the phosphorus which enters into the composition of the lucifer matches at present in use, and to mention that Dr. Hierpe, of Stockholm, was engaged in an earnest endeavor to discover some means of producing effective friction matches without the aid of a substance the whole of our supply of which ought to be devoted to the fertilization of the soil, and which, when employed in the arts in the free state, is so frightfully injurious to those who are unfortunate enough to have to manipulate it.

Dr. Hierpe has since patented, both in Sweden and some other continental countries, a composition for the tips of friction matches, consisting of a mixture of four to six parts of chlorate of potash with two parts of bicarbonate of potash, two parts of either peroxide of iron, protoxide of lead, or deutoxide of manganese, and three parts of glue or other cement. Matches tipped with this composition will only ignite when rubbed upon a surface specially prepared. For this igniting surface Dr. Hierpe uses a mixture of twenty parts of sulphide of antimony with two to four parts of bicarbonate of potash. four to six parts of either oxide of iron or oxide of lead, and from two to three parts of glue. The new matches are no more costly than the old ones, and, besides having the advantage of their manufacture being innoxious, and not involving the consumption of any substance which ought not to be spared from other purposes, are immensely *safer* than our ordinary matches, since they will not ignite except when rubbed upon a composition prepared expressly for the purpose.

GUN-COTTON ENGINE.

A "gun-cotton engine," invented by M. Jules Gros, is favorably reported upon by *Les Mondes.* No particulars of its construction are given, but we gather that it applies the force generated by combustion of gun-cotton to the compression of atmospheric air, and then employs the air thus compressed to work a piston. Its principle is thus the same as that of a gunpowder engine devised by the writer of these "Notes" some five years ago.

IRON IN BLOOD.

M. Pelouze has been making investigations respecting the quantity of iron contained in the blood of different animals. He finds that the blood of birds contains, per ten thousand parts by weight, from three to four parts of iron, and the blood of man, and that of mammaliferous animals generally, contains from five to six parts of iron per ten thousand parts of blood.—*Mechanics' Magazine.*

Galvanized Iron as a Ship-building Material.

It has long been admitted that, although iron is, undoubtedly, the most suitable material for the construction of ships, the readiness with which it fouls in sea water gives rise to much inconvenience; the consequence has been that almost innumerable compositions have, from time to time, been proposed to remedy the evil; yet the success obtained has been but very limited. A series of experiments have, however, recently been undertaken by Professor Crace-Calvert and Mr. Johnson, which seem to have led to the discovery of an effective remedy, and one which can be readily applied. The reliance which can be placed upon all experiments conducted under Prof. Crace-Calvert's supervision are too well known to need comment; it will, therefore, suffice to record the experiments themselves.

They took 20 square centimeters of each metal, which they cleaned with great care and attention, in order that the action of the sea water might have its full effect; then two plates of each metal were placed in separate glass vessels, and immersed in equal volumes of sea water. After one month the plates were taken out, and any compounds that had adhered to the surface carefully removed; the plates were then dried and re-weighed, and the loss estimated. To render their results of more practical value, they calculated the action of 100 liters of sea water upon 1 square meter of each metal, and found the amount of metals dissolved to be—Steel, 29·16 grammes; iron, 27 37; copper (best selected), 12·96; copper (tough cake), 13·85; zinc, 5·66; galvanized iron 1·12; block tin, 1·45, and stream tin, 1·45 grammes. Of virgin lead and of common lead the quantity dissolved was merely a trace. The conclusions to which these results obviously lead are that steel is the metal which suffers most from the action of sea water. and that iron is most materially preserved from the action of sea water when coated with zinc, and, therefore, not only should iron exposed to the action of sea water be galvanized whenever this is practicable, but, in their opinion, it would amply repay ship-builders to use galvanized iron as a substitute for that metal itself.

The extraordinary resistance which lead offers to the action of sea water naturally suggests its use as a preservative to iron vessels against the destructive action of that element; and though they are aware that pure lead is too soft to withstand the wear and tear which ships' bottoms are subjected to, still they think that an alloy of lead could be produced which would meet the requirements of ship-builders. Feeling that experiments made with a limited amount of sea water might not be a fair criterion of the action of the ocean upon metals, they repeated their experiments upon plates of 40 centimeters square, which were immersed for one month in the sea on the western coast (Fleetwood), taking the precaution that they should be constantly beneath the surface of the water, and suspended by flax rope attached to a wooden structure, to prevent any galvanic action taking place between the plates and the structure to which they were attached. The amount of metals dissolved were—Steel, 105·31 grammes; iron, 99·30; copper (best selected), 29·72; zinc, 34·34; galvanized iron (Johnson's process), 14·42; lead (virgin), 25·69; and lead (common), 25·85 grammes.

It is to be remarked that the action was much more intense in this instance than when the metals were placed in a limited amount of water at the laboratory. These results are due, probably, to several causes acting at the same time—that the metal was exposed to the constantly renewing surface of an active agent; and that there was also a considerable friction exerted on the surface of the plate by the constant motion of the water, there being at Fleet wood a powerful tide and rough seas. What substantiates this opinion is that the lead plates undoubtedly lost the greater part of their weight, not by the solvent action of the sea water, but from particles of lead detached from them in consequence of their coming in contact with sand and the wooden supports to which they were attached; but this cause of destruction having been observed with lead plates, it was afterward carefully guarded against in the case of all the other metals.

Another series of experiments was likewise made, which cannot fail to prove of great value in connection with the application to ships' bottoms of copper and yellow metal sheathing—the action of sea water upon various brasses was carefully tested. They immersed for one month plates of various alloys in that fluid, and it was found that the action of 200 liters of sea water upon one square meter of surface was:—

COMPOSITION OF THE BRASSES.

	Copper.	Zinc.	Iron & Lead.
Pure copper and zinc.....	50·0	50·0	..
Commercial brass	66·0	32·5	1·5
Muntz metal (sheets)......	70·0	29·2	0·8
Muntz metal (bars)	62·0	37·0	1·0
Prepared brass.............	50·0	48 0	*

*And 2 per cent of tin.

QUANTITY OF METALS DISSOLVED.

	Iron.	Copper.	Zinc.	Total.
Pure copper and zinc.	....	1·110	10·537	11·647
Commercial brass....	0·579	3·667	3·324	7·570
Muntz metal (sheets).	0·438	4·226	2·721	7·385
Muntz metal (bars)...	0·501	2·697	3·493	6·691
Prepared brass	†	7·040	3·477	10·882

† 0·365 of tin dissolved.

This table shows how very different sea water acts upon divers brasses, and the influence exercised upon the copper and zinc composing them, by the existence in them of a very small proportion of another metal; thus, in pure brass the zinc is most rapidly dissolved (which, *en passant*, is the contrary to what takes place in galvanized iron), while it acts as a preservative to the copper. Tin, on the other hand, appears to preserve the zinc, but to assist the action of sea water upon the copper. The great difference between the action of the sea water upon pure copper and upon Muntz metal seems to us to be due not only to the fact that copper is alloyed to zinc, but to the small proportion of lead and iron which that alloy contains; and there can be no doubt that ship-builders derive great benefit by using it for the keels of their vessels. They were so surprised at the inaction of sea water upon lead, that they were induced to compare its action with that of several distinct varieties of water—Manchester Corpora-